

Solutions

Each answer shows the steps, then the **result**.

2.1

- Newton's second law for rotation, $\tau = I\alpha$:

$$\alpha = \frac{\tau}{I} = \frac{12 \text{ N m}}{3 \text{ kg m}^2}$$

- $\alpha = 4 \text{ rad s}^{-2}$

2.2

- Rotational inertia I

2.3

- Newton's second law for rotation:

$$\tau = I\alpha = (5 \text{ kg m}^2)(2 \text{ rad s}^{-2})$$

- $\tau = 10 \text{ N m}$

2.4

- It makes α smaller

3.1 B

- $\tau = I\alpha$

3.2 A

- $\tau = I\alpha$, rearranged:

$$\alpha = \frac{\tau}{I} = \frac{6 \text{ N m}}{2 \text{ kg m}^2} = 3 \text{ rad s}^{-2}$$

3.3

(a)

- $\tau = I\alpha$, rearranged for α :

$$\alpha = \frac{\tau}{I} = \frac{4 \text{ N m}}{0.5 \text{ kg m}^2}$$

- $\alpha = 8 \text{ rad s}^{-2}$

(b)

- It doubles

3.4

(a)

- from rest at constant α :

$$\alpha = \frac{\Delta\omega}{\Delta t} = \frac{6 \text{ rad s}^{-1} - 0}{3 \text{ s}}$$

- $\alpha = 2 \text{ rad s}^{-2}$

(b)

- Newton's second law for rotation:

$$\tau = I\alpha = (4 \text{ kg m}^2)(2 \text{ rad s}^{-2})$$

- $\tau = 8 \text{ N m}$